

**The top 50 European  
electronics companies**

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**Will pen-based computers  
ever grow up?**

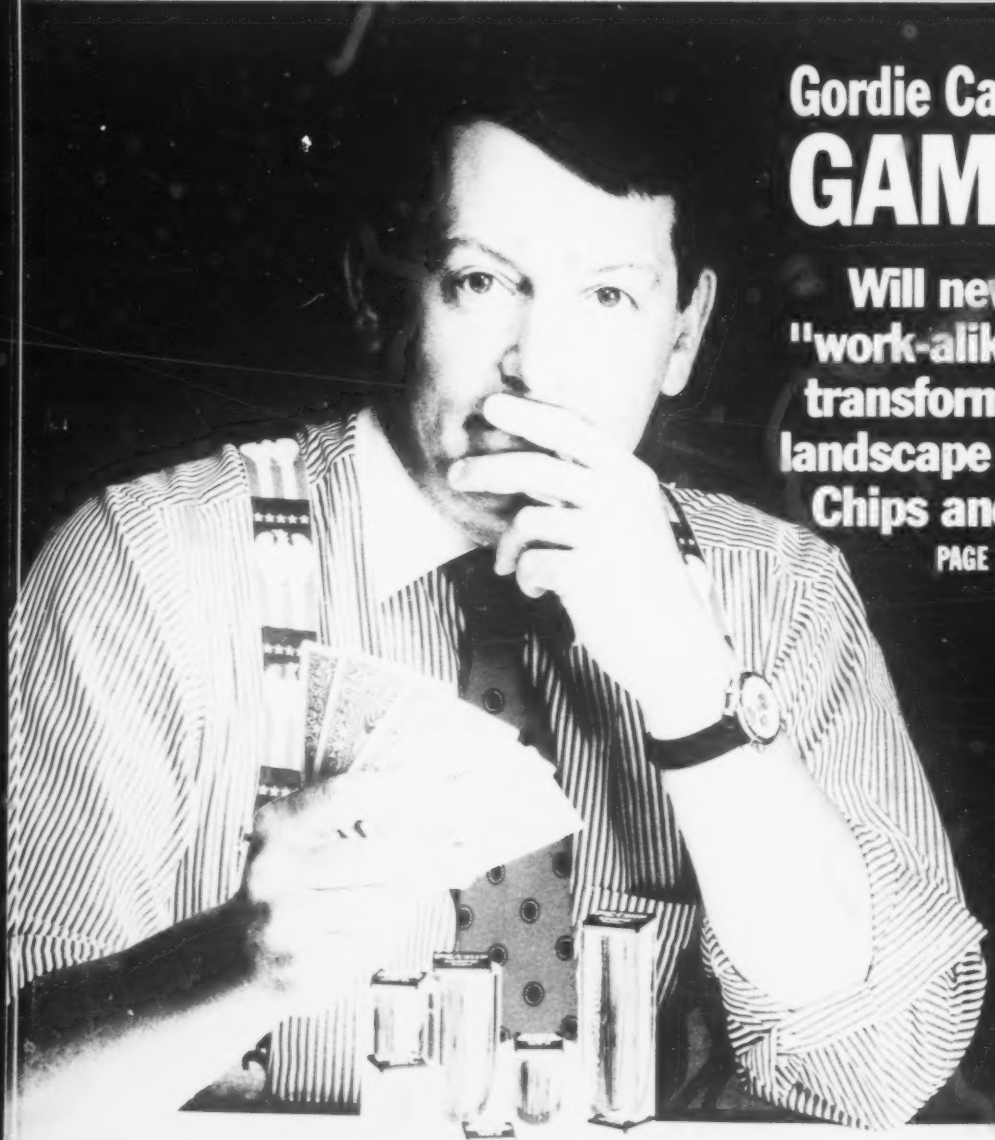
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A CAHNNERS PUBLICATION

# Electronic Business®

FOR THE MANAGEMENT TEAM IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES - WORLDWIDE

OCTOBER 21, 1991



## Gordie Campbell's **GAMBLE**

**Will new 386  
"work-alike" MPUs  
transform the PC  
landscape and save  
Chips and Tech?**

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Gordon Campbell, president  
and CEO of Chips and Technologies Inc.

# Electronic Business

VOLUME 17, NUMBER 20

FOR THE MANAGEMENT TEAM IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES-WORLDWIDE

OCTOBER 21, 1991

Cover photo by Christopher Springmann



**PAGE 34** Chips and Technologies president and CEO Gordon Campbell takes a gamble

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## INSIDE BUSINESS

# New roads open to PC marketplace



**Senior editor**  
**Teri Sprackland**

**T**HESE ARE the days of falling empires and unrealized alliances the world over. On this, the 10th anniversary of the birth of the personal computer, industry watchers are witnessing the erosion of an industrial hegemony as important to information technology as the Soviet Union has been to world politics.

We're talking about the end of Intel Corp.'s virtual monopoly over the 386 microprocessor.

The recent hard-won legal victory by Advanced Micro Devices, giving it the right to clone the 386, is only the most obvious crack in what could be called the Silicon Curtain. New roads are opening for PC makers, and not a moment too soon. As the PC, itself, coasts to commodity status, manufacturers are desperately looking for ways to restore the kind of profitability they need to innovate, compete, even survive. That's why senior editor Teri Sprackland's exhaustive, in-depth look at the 386 chip market deserves cover-story status in this issue.

Teri takes us beyond the AMD decision to the upcoming generation of "forward-engineered" processors. Freed to some extent from direct legal retaliation, the vendors of these new products are promising added

speed and functionality, as well as a faster product-development cycle—which would translate into a radical change in the market for DOS-based systems. Intel executives, and some industry experts, warn of compatibility problems, but Teri finds general agreement that these will be overcome—must be

overcome, in fact, if PC makers are to withstand the incursions of RISC-based workstations into the high end of the PC domain. Intel competitors, meanwhile, must balance the high cost of product development against the need to make new products price-competitive. Price cuts remain a powerful weapon in the hands of an industry leader such as Intel. It all adds up to a new competitive arena for manufacturers and a new range of choices for PC users.

Finally, London-based senior editor Barbara Berkman steers readers through the labyrinth of mergers and acquisitions in the European electronics market. U.S. companies are doing their shopping overseas, snapping up European companies at a record clip. Accompanying her report is the exclusive ELECTRONIC BUSINESS listing of top European companies, required reading for acquisition- or investment-minded U.S. execs.

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**VBPA AIB**

tle the portable computer data-storage world with some low-power, lightweight (albeit expensive) 10-and 20-Mbyte flash memory "disk drives."

—By David Webb in San Jose

## STANDARDS

### User group feud also muddies vendors' waters

**E**FFORTS BY X/Open to increase its influence within the computer user community could escalate a so-far quiet rivalry with the Corporation for Open Systems (COS). It could also further muddy already murky user-group waters and confuse computer manufacturers seeking direction.

X/Open, a standards-adopting consortium of computer vendors and users, says it wants to give users and software developers a greater say in its direction and has ambitions of becoming an umbrella organization for other user groups. X/Open, in Reading, England, has had some success in establishing an open computing environment based on de facto and international standards, and serving as neutral ground for such bitter rivals as the Open Software Foundation and Unix International.

COS, in McLean, Va., has been pursuing the goal of multivendor interoperability and user support by championing Open Systems Interconnect and comparable standards. In some cases COS and X/Open even have overlapping memberships. COS's claim as the voice of users was strengthened earlier this year when it combined with another group, the User Alliance for Open Systems.

Although X/Open CEO Geoff Morris says his group and COS have discussed closer cooperation, those talks have yet to yield results, says Mike Walter, COS marketing and corporate services vice president. Walter acknowledges some danger of a split in the user community without a common agenda. He plays

down the rivalry between the two groups but says the decision by the User Alliance to join COS "speaks volumes" about its standing among users.

—By Rick Whiting

## STRATEGIES

### Cadence/Valid merger will shake up the EDA world

**A**SSUMING THE INK dries on the pending Cadence Design Systems/Valid Logic merger, how will EDA customers and manufacturers respond to the emerging dominance of larger companies? Should EDA's cash-starved small fry become nervous about survival? Will EDA users have access to the same range of choices they now have?

One potential problem is adherence to standards. The new Cadence—and perhaps fellow "giant" Mentor Graphics—could decide to renege on

commitments to support industry standards to better protect their large market shares. To date, they both continue to preach cooperation as the best means to industry growth.

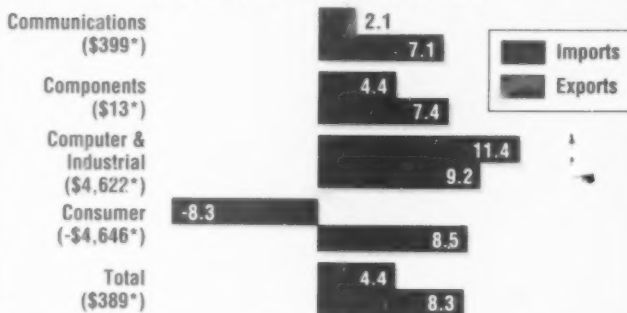
The new Cadence—the name Valid will no longer be used—will have a 35% share of the \$1 billion market for EDA software, up from 23% in 1990, says analyst Gisela Wilson with International Data Corp. By combining Cadence's dominance in chip design with Valid's surging popularity in PCB design, it will replace troubled Mentor as the first option for customers seeking broad commercial EDA solutions, she says.

Some customers plan to delay EDA purchases until Cadence decides what to do with overlapping product lines, but the overall response from users is mostly positive. "We currently do business with too many EDA vendors," says Ben Warren, CAE director at Chips and Technologies Inc. "This could allow us to shorten that list."

## TRADE

### U.S. electronics trade improves

(% change, Jan.-June 1991 vs. a year ago)



\*Trade balance in \$ millions as of 6/91

Source: Electronic Industries Association

The U.S. electronics industry grew exports nearly twice as fast as imports during the first six months of 1991. As a result, the U.S. enjoyed a \$389 million electronics trade surplus, a sharp reversal from the \$863 billion deficit seen in the first half of 1990. The forecast: Electronics exports from the U.S. will continue to boost the surplus next year. The dollar is likely to drop slightly because of a soft recovery and lower interest rates in the United States.

—By Elizabeth B. Baatz

The deal is the biggest yet in EDA's ongoing consolidation Valid, which returned to financial health in 1991 after years of doubt, was the number three player before the merger.

—By Peter Burrows

## TELECOMMUNICATIONS

### Rural U.S. could be next telecom "Field of Dreams"

**I**N "FIELD OF DREAMS" Kevin Costner heard voices in his cornfield. Recently, Congress has concluded that *everyone* should be hearing voices in their cornfields—a message that could mean opportunities for telecom equipment makers.

A \$385,000 year-long study requested by the Joint Economic Committee concluded that, to compete with city slickers, rural Americans need to beef up their telecommunications strategies. Service industries now account for 57.7% of rural resident employment, and access to advanced telecommunications would provide rural businesses access to major domestic and foreign markets. Before the Bell system break-up, phone companies were required to provide rural areas with equal access to leading-edge telecom technologies, but that is no longer the case.

Among the recommendations:

- Expand the Rural Electrification Administration—a federal loan program—to act as a technology planning or research body as well as provide financial support;
- Implement Electronics Data Interchange technology in rural areas to streamline buying and selling transactions;
- Expand the Rural Area Network, which would electronically link community users in businesses, education, and government;
- Encourage rural businesses to emulate the techniques now used by their urban counterparts—local-, wide- and metropolitan-area networks.

It's unclear how big an opportunity this is for telecommunication service and equipment vendors—the

report doesn't quantify the possible business opportunities in dollars. One possible model, the University of Maine/Telecommunications System's new fiber network, was developed with a \$4.4 million grant from the Department of Education and a matching grant from the state.

More typical are the rural businesspeople who don't see a need to change. Says one, "I supervise operations, keep the books, even sweep the floor. When would I ever have time to learn about how to use communications strategically?"

—By Quang Bao

## MARKET FORECAST

### Robotics makers ready themselves for slump

**A**FTER BUCKING THE recessionary trend last year, the \$488 million U.S.-based robotics industry is bracing for a contraction. And it may behoove the components, software, and controller suppliers to the robotics industry to do the same.

New orders dipped 4% in the first half of 1991 compared with 1990 on a unit basis. Although that decline is a far cry from the 25% first-half orders drop that hit during the dev-

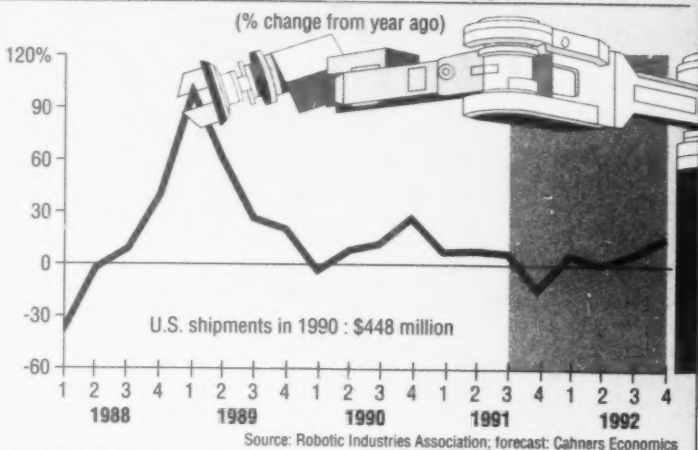
astating 1987 industry recession, it does not augur well for the robotics forecast.

Cahners Economics in Newton, Mass., forecasts a slight drop in sales dollars this year and a 7% rise next year. Bruce A. Potts, vice president and general manager for the industrial division of GMFanuc Robotics, disagrees. Potts expects another peak for robotics sales this year as the automobile industry winds up its capital investment purchases and a decline for robots next year.

According to the Robotics Industry Association in Ann Arbor, Mich., sales dollars rose 7% in the first six months of 1991, but only because of a 12% price increase. Unit shipments of robots actually fell 6%, which is in line with the decline in orders. Pent-up demand for robots has helped U.S. manufacturers force through price increases.

Exports have also been a key to growth in the U.S. robotics industry. International orders accounted for nearly 30% of all orders in the second quarter of 1991. Donald A. Vincent, executive vice president of the Robotics Industry Association, says overseas robotics use is growing faster. He estimates only 41,000 robots are in use at U.S. factories compared with 200,000 in Japan and be-

### Growth in robotics shipments staggers in 1991



## BUSINESS TRENDS

tween 40,000 to 50,000 in Western Europe. Two of the three top robotics manufacturers are U.S.-based Adept Technology, GMFanuc, followed by Europe's ABB Robotics.

—By Elizabeth B. Baatz

### CAPITAL SPENDING

#### Capital spending plans revised downward for 1992

**F**INANCIAL OFFICERS at electronics companies are more pessimistic now about capital spending plans than they were three months ago, and makers of high-tech equipment will feel the pinch next year. Capital spending budgets should continue to be revised downward for the next few quarters as profits slide.

Of the 73 chief financial officers surveyed by ELECTRONIC BUSINESS this past July, 31% reported an in-

crease in outlays for capital equipment in the second quarter of 1991 compared with a year earlier. As for the year ahead, only 47% in the finance office expect to beef up capital spending budgets in 1992, compared with 57% who last spring indicated rising budgets for the coming year.

The recession caused CFOs to revise their capital spending last year as well. In late 1990, only 25% of financial officers on the ELECTRONIC BUSINESS panel expected to see less spending by the end of the year. When the same group was surveyed again after the year was over, 41% said capital spending had fallen in 1990 below 1989 levels.

Slumping sales continues to be the main culprit for sluggish spending plans, say 43% of the respondents.

The finance execs who work for Japanese subsidiaries in the U.S. report capital spending hasn't slowed at all. "There are no constraints here," says one unknown finance manager, "We are a foreign-owned branch that is going to make a project happen. Cost is no object."

—By Elizabeth B. Baatz

#### CFOs expect to lower capital spending

(% of respondents)

1991 Survey quarter

|                                 | Q1    | Q2      |
|---------------------------------|-------|---------|
| Average spending (\$ thousands) | \$931 | \$1,149 |

Expected change in spending in . . .  
... 1991 vs. 1990

|                |       |       |
|----------------|-------|-------|
| More spending  | 38.6% | 34.3% |
| Less spending  | 38.6  | 40.0  |
| About the same | 22.8  | 25.7  |

... 1992 vs. 1991

|                |      |      |
|----------------|------|------|
| More spending  | 56.8 | 47.1 |
| Less spending  | 15.9 | 18.6 |
| About the same | 27.3 | 34.3 |

... the latest quarter vs. year ago

|                |      |      |
|----------------|------|------|
| More spending  | 25.6 | 31.4 |
| Less spending  | 55.8 | 44.3 |
| About the same | 18.6 | 24.3 |

... the upcoming quarter vs. year ago

|                |      |      |
|----------------|------|------|
| More spending  | 29.5 | 31.4 |
| Less spending  | 34.1 | 44.3 |
| About the same | 36.4 | 24.3 |

Source: ELECTRONIC BUSINESS

### MARKET TRENDS

#### Value added may offset 4-Mbit DRAM price drop

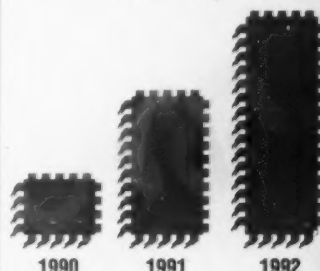
**S**OME BATTLE-SCARRED veterans of the commodity memory business are hoping for bigger profits in the 4-Mbit market. They expect to do this by targeting specialized niches to slow the dizzying drop in prices that has plagued every new generation of memory chip as it enters volume production.

Several big-name DRAM producers are focusing on power and packaging features designed to add value in portable computing applications. Hitachi, for one, has introduced low-power versions of previous generation chips and will be formidable competition for the second-tier vendors.

How successful they'll be isn't yet clear. The 4-Mbit DRAM is expected to triple in sales next year but drop

#### Worldwide 4-Mbit DRAM sales surge

(\$ billions)



Source: In-Stat Inc.

in price by as much as 50% this year as volume comes on line from second-tier vendors such as Hyundai Electronics and Goldstar Electron. Hyundai, for example, expects to double its semiconductor sales to \$500 million next year even though prices are forecast to drop from \$15 each in September to \$10 per part by the end of the year, says Runbir Singh, manager of product planning for Hyundai Electronics America's semiconductor division.

Hyundai plans to diversify out of the commodity DRAM business into specialized speed and power configurations. Portable computer makers are clamoring for chips that can reduce board space and lower power consumption, and they are willing to pay a little extra for the packaging and design features that make such benefits possible, Singh says.

Goldstar's 4-Mbit products feature the lower-power operations and innovative packaging to compete successfully against the first generation of 4-Mbit DRAMs already available from other suppliers. First-generation suppliers are already moving into lower-cost production.

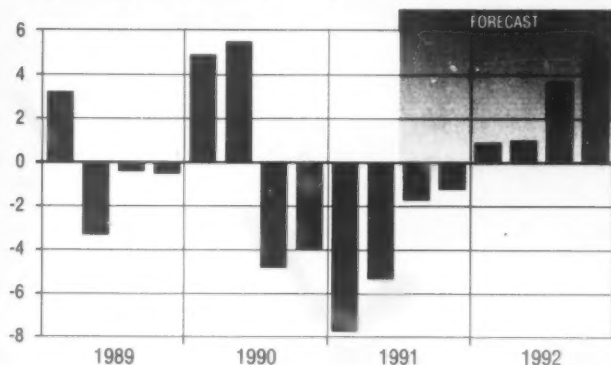
Right now, 4-Mbit DRAM sales are 37% of the total DRAM market but will be 53% by next year, according to market research firm In-Stat Inc. By 1993, the momentum will have moved on to the next density at 16-Mbits, predicts In-Stat.

—By Teri Sprackland in San Jose

## BUSINESS BAROMETER

### Measurement and control sales to expand...

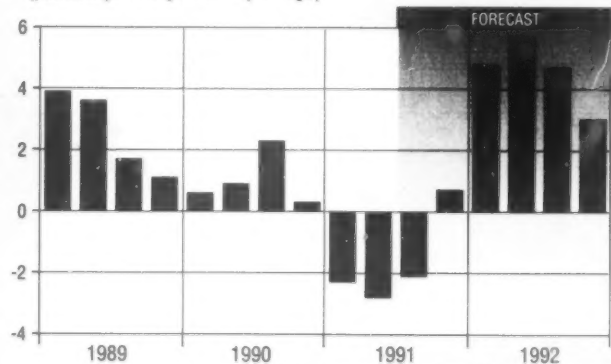
(percentage change from a year ago)



Source: Commerce Dept., forecast: Cahners Economics

### ...as factory output picks up steam, too...

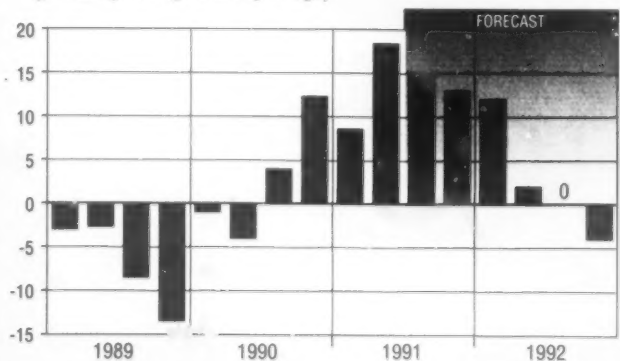
(percentage change from a year ago)



Source: Federal Reserve Board; forecast: Cahners Economics

### ...and ATE index reveals strength in '91

(percentage change from a year ago)



Source: ELECTRONIC BUSINESS; forecast: Cahners Economics

## Measurement market forecast to rise

**A**N EXPANSION in the nation's economy is due to benefit most industries in the coming year. Manufacturers of measuring and controlling instruments are particularly interested in seeing factory production improve at a rapid pace. Historically, this market closely follows the growth cycle of total industrial production.

In 1988, production in all industries expanded 5.4%—the most recent high for annual growth. During the same year, factory capacity utilization stood at 84.8%, and measuring and controlling instruments also climbed to a peak annual growth rate of 10.7%. By 1990, however, production growth slowed to 1%, factory capacity utilization dropped to 79.4%, and instruments shipments suffered a mere 0.3% rise.

In 1991 measurement and control shipments are likely to fall 4.1% below last year. Relief is in sight, however. Industrial production expanded for four consecutive months after reaching a low point in March 1991, which bodes well for the instruments market. Shipments are forecast to rise 2.9% to \$2.84 billion in 1992 and increase again 4.3% to \$2.96 billion in 1993.

Sales of automatic test equipment are driven by the same factors as the broader category of measurement and control instruments. ELECTRONIC BUSINESS's automatic test equipment (ATE) sales index indicates that shipments in the first half of 1991 jumped 13.5% above the same period a year earlier. ATE sales are expected to climb 13.8% to \$2.4 billion by the end of this year.

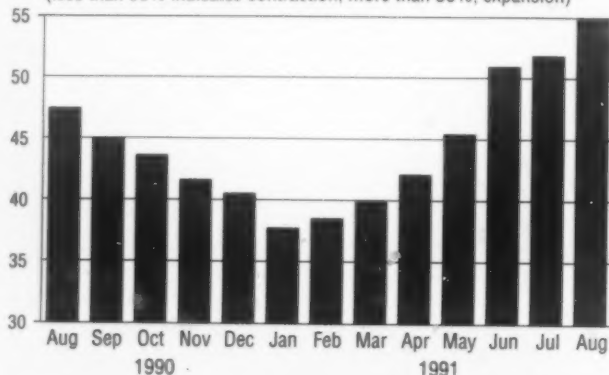
—John Farrell

For more information on Cahners Economics' forecasting services, call (617) 630-2105; fax (617) 630-2100; or write Cahners Economics, 275 Washington St., Newton, MA, 02158 USA

## BUSINESS BAROMETER

### Buyers reveal the recovery is underway

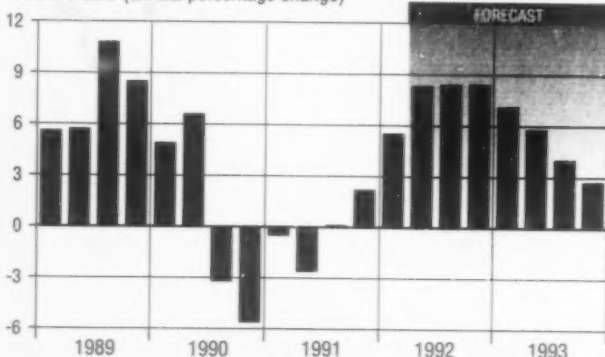
(less than 50% indicates contraction; more than 50%, expansion)



Source: National Association of Purchasing Managers

### With demand for electronics expected to rise...

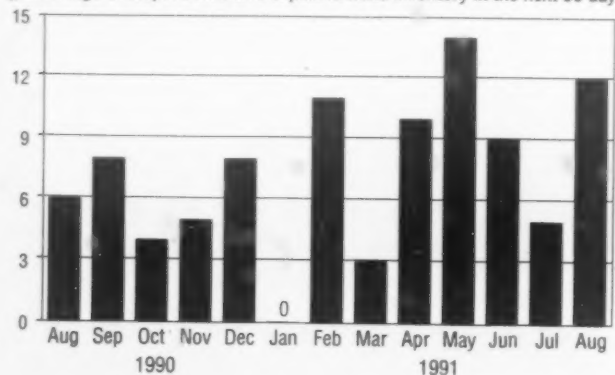
New orders (annual percentage change)



Source: Commerce Dept.; forecast: Cahners Economics

### ...electronics buyers must begin to re-stock

(percentage of respondents who expect to build inventory in the next 90 days)



Source: Electronics Purchasing

## Buyer surveys point to recovery ahead

**F**OR THE PAST few months, talk has centered on whether the economy is actually out of the red. Depending on whom you ask, you might get very different answers. While consumers have remained leery about the economic outlook, purchasing managers have seen positive signs.

The National Association of Purchasing Managers reported the manufacturing economy is, indeed, on its way to recovery. According to their survey of buyers, the Purchasing Managers' Index rose to 54.8% in August, up from 51.8% in July, and its highest level since December 1988. The index registered above 50 for the third month in a row for August, implying that the manufacturing economy has been expanding for three solid months. Prior to June 1991, the index hung below 50 for twelve straight months, suggesting the economy had been in a slump. The strong index value in August came from a surge in new orders, which secures growth in production over the next few months. Interestingly, this past summer's growth in the manufacturing sector took place without the help of increased inventory levels.

More specific to the electronics industry, *ELECTRONIC BUSINESS's* sister publication, *Electronics Purchasing*, reports in its monthly survey of 500 buyers that electronics companies were beginning to feel more optimistic several months ago. The August survey shows 12% of the respondents plan to build up inventory in the next 90 days, up from only 5% in July and 6% a year ago. Still, chances are the number of buyers planning to increase inventory won't climb to the 1988 levels of 25%. More and more companies are perfecting just-in-time inventory programs. As a result, the likelihood of seeing severe inventory swings as in past years is doubtful.

—Julie Handelman

# Chips and Tech RAISES the ante in the 386 "work-alike" CHIP WAR

AMD and Chips and Technologies seek to wean PC-makers from Intel's monopoly. The lure, they say, is increased product differentiation

By Teri Sprackland

**T**he introduction of alternative 80386 "work-alike" microprocessors—with most of the new chips claiming better performance and more value-added features than Intel's originals—may finally unchain PC makers from the Intel monopoly. These parts may also provide an alternative to selecting reduced instruction set computer (RISC) architectures.

Advanced Micro Devices Inc. (AMD) was the first to jump into the DOS-compatible processor game with its AM386. Now Chips and Technologies Inc. has waded into the fray, and several others—Texas Instruments Inc. (TI) among them—are thought to be close behind. Make no mistake, the flood of 386 work-alikes—or "work-betters" as Chips and Tech president and CEO Gordon Campbell likes to call them—is on the way.

What does all of this mean for the industry? Does it now make sense for PC-makers to tempt the wrath of Intel by using alternative parts? Can gutsy chip makers, some without fab capacity, survive a price war or a battle over intellectual property rights with Intel? Will margins so decline that no one makes money in the DOS-compatible processor business, or will the flood of new products reinvigorate the PC industry by permitting greater

product differentiation and lower costs?

Clearly, the PC and iax86 microprocessor business landscape will be forever changed. The last monopolistic leg of the IBM-Microsoft-Intel triumvirate, which invented the PC revolution and rode a monopoly to success, is falling. Whether that's good or bad isn't yet clear.

AMD, in Sunnyvale, Calif., paved the way for the work-alike 386s by pursuing a three-year legal odyssey to validate its right to clone the 386. Earlier this year, AMD introduced clones with higher speeds and lower power consumption than Intel originals, and it earned a number of PC and notebook design wins.

**M**OST RECENTLY, Chips and Technologies has entered the market with seven iax86-compatible products that it claims are "forward engineered"—that is, they are based on existing standards but are not mask-compatible and do not use the same microcode. The San Jose-based manufacturer, which first stoked the PC clone fires with its chipsets and was later burned by plummeting margins, is offering multiple flavors of the 386. It is hoping to win big sales by giving PC makers a broader choice of options with which to differentiate their product. On paper, that sounds like a strong strategy.



Chips and Technologies president and CEO Gordon Campbell

Dorothy Aron

Other potential 386 suppliers include Cyrix Corp., Integrated Information Technology Inc. (IIT), and NexGen Microsystems Inc. Even Texas Instruments is said to be close, perhaps partnering with a smaller company. Cyrix and IIT have already successfully introduced value-added Intel-compatible math coprocessors, and both reportedly have "skunk works" processor projects underway.

"The CISC processor market has been fat, dumb, and happy, while RISC has seen performance and price benefits from intense competition. Our intention from the word 'go' has been to slow the need to migrate to RISC," says Kevin McDonough vice president of engineering at Cyrix in Richardson, Tex.

PC makers are cheering those words and subsequent part introductions, although some are still doing so quietly. Fear of being caught up in legal battles between Intel and its competitors, fear of becoming the test case for compatibility issues, and just plain fear of Intel have kept the less intrepid PC houses from saying much.

Even many end users are wary of buying a PC without an Intel microprocessor inside. Intel executives made hay over an incident this summer when a customer of Northgate Computer Systems Inc. in Minneapolis, Minn., re-

turned a shipment because the processors used were from AMD, not Intel. Robert Reul, Northgate's vice president of quality systems, says that AMD's parts are completely compatible, "but some customers don't want the extra 8 MHz if it means switching from tried-and-true Intel to a new supplier."

Intel senior vice president David House is among Intel executives ensuring that the world hears about the Northgate returns, which reportedly involved customer concern over how well AMD processors would work within a network of Intel processors.

"It doesn't matter if it's a network problem or a chip problem. There's no such thing as a little incompatible," House says. "It's like being a little pregnant."

PC and chip makers will eventually surmount the compatibility barriers, agree most industry observers. Early adopters are starting out with products based on higher speeds or lower power for specific applications such as notebooks. As the legal issues are clarified and competition increases availability of 386 "work-alikes," OEMs are expected to expand their buying patterns. The new 386s will likely be available with a wide variety of value-added features to help PC makers differentiate their products. That would also provide a weapon

to fight off the price/performance attack being mounted by RISC-based workstations.

In the old days, Intel announced the speed upgrades at its leisure—typically not until it had wrung the maximum profit from the earlier generation. On the other hand, RISC microprocessor makers have always competed fiercely to increase performance to cut prices and often introduced faster versions of their chips before systems based on earlier generations have begun shipping.

As the RISC price/performance costs declined, PC makers have wondered if they should stick with the large installed hardware and software base surrounding the DOS-compatible iax86 family or move to RISC.

Intel is trying hard to corral the potential defectors before they start a stampede to RISC. In an unusual change of pace, Intel executives are quite openly discussing their next generation "P5" product—a processor that will offer the performance of the RISC-based workstation engines while retaining full iax86 soft-

### Chip prices expected to fall

|               | 1991      | 1992*    |
|---------------|-----------|----------|
| <b>386 SX</b> | \$59      | \$30     |
| <b>DX</b>     | \$161-202 | \$90-110 |
| <b>SL</b>     | \$144     | \$100    |
| <b>486 SX</b> | \$247     | \$150    |
| <b>DX</b>     | \$445-665 | \$275    |

\*Projected

Source: Needham & Co.

ware compatibility, they claim.

Intel isn't alone in the pursuit of RISC performance and DOS compatibility. NexGen, a San Jose start-up funded by Chips and Tech, plans to release a combined processor chipset with RISC-like features next year that NexGen claims will have twice the performance of the 486 and full compatibility with the DOS and 80x86 standards.

PC makers' big hope, of course, is that the new 386 and 486 processors will expand the

## Value-added features separate 386 clones from Intel

**C**OMPETITIVE PRICING IS one of the goals of every chip maker offering clones of Intel's 386, but the real pitch is based on the value-added features that differentiate the work-alike offerings from the original 386.

Advanced Micro Devices Inc. offers 40-MHz speed on its AM386, about a 25% increase over Intel's fastest part. Lower power consumption is another selling point. The fully static core of the part allows the chip to drop to virtually zero power consumption when in a power-down mode. AMD also offers its chip in a low-cost plastic quad flat pack that uses 40% less board space than a conventional and more expensive ceramic package.

Chips and Technologies Inc. has developed a bevy of work-alikes offering more performance, lower power consumption, and greater design flexibility in processors targeted at specific applications.

Most significant of Chips and Tech's achievements is a feature known as SuperState, a user transparent operating system and BIOS that allows the OEM to implement various features such as sleep mode or keyboard scanning in software. The SuperState function is another level of micro-

code capable of being programmed by the OEM to differentiate its system.

Chips and Tech has also developed a highly integrated "PC on a chip" based on the 8086 processor but offering two to three times the performance of Intel's version. Targeted at notebook, hand-held, and embedded applications, the processor has a fully static core for low power consumption. A graphics controller, memory controller, I/O controller, and other logic are integrated on the same chip.

Though it won't release all the details just yet, NexGen Microsystems Inc. plans to offer twice the performance of a 486 in addition to full DOS compatibility. The company's chipset—actually a six- to eight-chip subsystem—will include a powerful floating-point processor and other peripheral logic functions.

Don't expect Intel to ignore value-added opportunities itself. The company has already introduced its 386SL processor, a low-power static core chip with peripheral [logic on-chip]. Intel has announced plans to proliferate the 386 and 486 architecture horizontally in the future, offering more application-specific versions to meet new value-added opportunities. □

total PC market, giving continued life to the clone makers and slow the attack from RISC-based workstations.

AMD's attack on the laptop market is based on AM386 versions that offer low power consumption, small packaging, and increased integration features. The payoff could be enormous. Dataquest Inc., the San Jose-based market research firm, projects a 60% compounded annual growth rate for laptops until 1994.

Chips and Tech is going full speed ahead with seven product introductions. Six of those relate directly to the 386 or 387 math coprocessor market and several are rated up to 50% faster than Intel's products. The 0.8 micron CMOS is being manufactured at three undisclosed foundries. Chips and Tech is also targeting specific applications and has hinted that it has in the works a processor designed specifically to speed up Windows 3.0's performance.

**O**NE DIFFICULT question that potential users of 386 work-alike chips must answer is whether they believe the manufacturers of these chips have the financial wherewithal to succeed. PC-makers don't want to anger Intel by switching to a competing product only to have the new source go broke or be unable to provide performance upgrades.

Chips and Tech spent roughly \$50 million developing the new products, according to Campbell. Intel executives say it took \$100 million to develop the first 80386.

Intel could launch a preemptive strike by slashing prices, but that would be expensive. "Dropping the price of the 387 math coprocessor took \$350 million right out of Intel's bottom line," notes Campbell. "About 50% of its revenue, or 85% of its profit, comes from processor products. We don't think it will dramatically cut prices as it did on the 387."

To some extent, Campbell's comments are clearly self-serving. He seems to be saying to Intel, "Don't shoot! We can both do well enough if we leave each other alone." The fact is, though, the matter may slowly slip beyond either's control.

Plunging prices inevitably follow increasing supplies and suppliers. At Texas Instruments, Jean-Francois Barrati, marketing manager for its PC systems logic group, expects dramatic price erosions and notes that the entry of Cyrix

### Worldwide microprocessor shipments

(units in thousands)

|               | 1990  | 1991  | 1992  | 1993  | 1994  |
|---------------|-------|-------|-------|-------|-------|
| <b>486</b>    | 226   | 866   | 1,076 | 1,122 | 1,113 |
| <b>386 DX</b> | 3,866 | 4,198 | 4,346 | 4,242 | 3,885 |
| <b>386 SX</b> | 4,828 | 6,815 | 7,896 | 7,752 | 7,040 |

Source: In-Stat Inc.

and IIT as alternative math coprocessor suppliers provoked the severe price cut from Intel on the 387 product line.

The price of the 386DX dropped from about \$300 each during the spring to \$200 during the summer months, TI's Barrati says. "Those guys on Intel allocation were paying a higher price than the spot market—a real inversion. Yet they're afraid to irritate Intel too much because they need access to the 486. The price differential in August between the 486 and the 386 was only about \$100," Barrati says.

Currently, it looks as if the winners in the clone processor wars will have the right mix of business acumen and technology sparkle: two parts marketing and management and one part technology, says Erik Jansen, semiconductor analyst with Robertson, Stephens & Co. in San Francisco. "Technically, Chips and Tech may be close, but in marketing and managing, it's way behind. Intel can always play the pricing trump card," Jansen comments.

Indeed, the financial health of Intel's competition has not been robust. While Intel boasts of the \$1 billion it spent last year and the billion more it will spend this year on research and development, Chips and Tech posted a \$9.6 million loss in the quarter ended June 30. It probably won't turn a profit in '91, agrees Campbell, who says Chips and Tech's move into the processor market is a "bet your company" move.

Cyrix and IIT are small, privately held companies. NexGen is a four-year-old start-up with no product and no cash flow. AMD, a company whose very survival was in doubt last year, is bouncing ahead on the revenue generated by its new 386 product line, but competition will cut into those margins soon, ana-



**Mike Webb, AMD's director of marketing for personal computer products**

lysts point out.

One key to success will be managing the relationship between suppliers and customers. "The world may not love Intel, but the world doesn't smile too broadly on Chips and Tech, either," Jansen notes, adding that Asian buyers privately comment bitterly on misleading communications about new products from Chips and Tech.

Other potential players have not revealed what value they plan to bring to the processor party. Cyrix's McDonough won't discuss new products beyond math coprocessors, but he advises industry observers to "stay tuned" as development will proceed quickly. "We're not staying in math coprocessors alone," McDonough says.

Integrated Information Technology Inc. in

## Legal battles drag on over 386 chips

**T**REMENDOUS TECHNICAL challenges notwithstanding, the biggest obstacle to those who would try to enter the 386 clone market has been the legal hurdles Intel has erected.

Since its battles against clones from Japan's NEC Corp. in the mid-'80s, the Santa Clara, Calif.-based microprocessor maker has used every legal stratagem at its disposal to protect its monopoly on the 386 and related products.

It appears, however, that the tide of justice is beginning to flow against Intel, despite the fact the company successfully defended its 386 architecture for five years in court. First, a long-awaited arbitration-ruling declared Intel had illegally frustrated Advanced Micro Devices Inc.'s second-sourcing plan. Then a judge ruled the numbers "386" were generic, paving the way for companies such as AMD to use the numbers in their marketing plans.

Still to be resolved is the remedies portion of the arbitration. AMD refers to this section as the sentencing or punishment of Intel and expects to get in excess of \$500 million in reparations, as well as clear manufacturing rights to the Intel 386, according to an AMD spokesman. Most industry observers are doubtful AMD will receive a fraction of what it expects to receive in reparations.

In an Intel suit against AMD in the U.S. district court in San Jose, Intel has alleged that AMD does not have the right to use Intel microcode in the math coprocessor products it is selling and the transfer of the microcode under a ten-year-old agreement was for AMD's internal use only.

Chips and Technologies Inc. CEO Gordon Campbell is confident his company can weather any legal storm Intel might precipitate. "AMD exercised a loophole in In-

tel's intellectual property protection. We don't have any loophole," he says.

The Chips and Tech microcode is "clean room" engineered and completely different from Intel's—even better, he claims. The microcode has been copyrighted and several patents have been filed.

Microprocessor analyst Michael Slater is not so confident. "I think the biggest problem Chips and Technologies will face is the legal challenge from Intel. Even if Intel can't win, it can delay time to market, and that will hurt Chips," he says.

To avoid legal battles with Intel, NexGen has also developed its own microcode and has even taken the step to never hire anyone who has ever worked for Intel. "We're one of the cleanest companies in the world from that point of view. We have a dramatically different architecture. We don't even interview people with Intel experience."

AMD struck a blow in its fight against Intel with a suit filed in late August, alleging that Intel has violated both the Sherman Act and the Clayton Act by engaging in anticompetitive acts to monopolize the market, and AMD is seeking \$2 billion in damages. If this case comes to court, AMD will need to present proof of long-standing allegations that Intel has forced customers to buy its other products if they wish to buy its sole-sourced 80386.

"When Intel is put on notice for intimidating customers or charged with anticompetitive practices, it helps erase the fear, uncertainty, and doubt from customer's minds," NexGen CEO S. Atiq Raza says.

"The best thing that could happen would be if a supplier were sued and the issue were quickly resolved. Time is always on the side of the first supplier," InfoCorp senior vice president David Carnevale notes. □



**Kevin McDonough,**  
vice president of  
engineering at Cyrix

Santa Clara, Calif., is another talked-about candidate for building 386 workalikes that has remained fairly quiet about its plans. The company has already released three grades of math coprocessors. "We're faster, lower power, and cheaper than Intel's math coprocessors," claims Paul Chub, director of marketing in describing IIT's strategy. "Customers deserve a choice."

NexGen CEO S. Atiq Raza acknowledges the development of NexGen's proces-

sor has taken more than a year longer than first projected.

"We're feverishly working to produce a product by 1992," says NexGen's Frank Wilde, vice president of sales and marketing.

NexGen's product, when introduced, will be binary-compatible with the iax86 family, with floating-point capability equivalent to a second-generation RISC chip. "We're in the same range as the Mips R4000 or [TI's] Sparc Viking project," Raza claims. "Our competition will be the RISC machines and the Intel 586," he says. Pricing will be "more than competitive."

Surprisingly enough, Sun's recent moves to position itself as a software supplier as well as a workstation maker may help the 386 machines climb the ladder into the workstation world. In September Sun announced that all of its workstation applications—considered the most robust offering of software available for high-end RISC platforms—will be ported to run on 386-based machines. The move gives Sun a bigger market for its software but also legitimizes the usefulness of DOS-compatible PCs in the markets traditionally

dominated by workstations.

Across the Pacific, VM Technologies and NEC Corp. may eventually join the 386 or 486 competition, says Michael Slater, editor of *The Microprocessor Report* in Sebastopol, Calif.

**S**O WHO'S GOING TO USE the new processors? Arche Technologies Inc., a second-tier PC maker based in Fremont, Calif., has put the AMD 80386DX microprocessor into a product aimed at what it calls the PC workstation. The processor's 40-MHz speed has the edge on Intel's product, offering better performance at a significantly lower cost, says Mike Webb, AMD's director of marketing for personal computer products.

Arche's director of marketing, Stephen Doherty, calls his company's relationship with AMD "very close" and questions whether other suppliers will be able to offer the same level of reassurance for compatibility anxieties. "They must be absolutely pin- and software-compatible. That's the biggest issue, even bigger than the legal issues," Doherty says.

AST Research Inc. in Irvine, Calif., is using the AMD 386 at the 25-MHz version to power its latest notebook computer. Yet vice president of marketing Mike Morand says Intel has "right of first refusal" as its primary supplier; only if Intel doesn't offer a product variation will other suppliers be considered. However, "AST will always look at other microprocessors if there is a compelling reason—a unique quality that customers want," Morand says.

Most of AMD's design wins so far have been among second- and third-tier computer companies.

Michael Dell, CEO of Dell Computer Corp. in Austin says, "We don't see a massive economic benefit [with the AMD chip]. We're talking about a \$3,000 machine that we're basically phasing out. That's a \$100 part to begin with, so why save \$10 on a \$3,000 machine that has declining volume?" □

### Chips & Technologies at a glance

| Fiscal year ended June 30  | 1991      | 1990      |
|----------------------------|-----------|-----------|
| Sales (thousands)          | \$225,088 | \$293,401 |
| Net income (thousands)     | -\$9,624  | \$29,298  |
| Net income/sales           | -4.3%     | 10.0%     |
| Cost of sales/sales        | 63.3%     | 54.9%     |
| R&D/sales                  | 23.4%     | 15.5%     |
| Marketing, G&A/sales       | 21.7%     | 15.8%     |
| Number of employees        | 724       | 665       |
| Sales per employee         | \$310,895 | \$441,205 |
| Net income per employee    | -\$13,293 | \$44,057  |
| Capital expenditures/sales | 3.8%      | 4.6%      |
| Current ratio              | 3.12      | 2.77      |
| Debt/equity ratio          | 0.12      | 0.10      |
| Foreign sales/sales        | 67.0%     | 63.0%     |

Source: Company reports

# Mergers and acquisitions reshape European electronics

Blitzed by regroupings and the search for critical mass, European computers and telecom become tough sledding for U.S. players

By Barbara N. Berkman

**F**or many of Europe's top 50 electronics companies, 1990 was a year of acquisitions, equity stakes, alliances, and spin-offs of noncore businesses. Concentrated in the computer and telecommunications industries, the changes gave some European companies more market share, access to new markets, and stronger financial positions.

In fact, mergers and acquisitions (M&As) in the electronics sector, both the number of deals and their value, outpaced such activity in any other European industrial sector, according to New York-based Translink's *European Deal Review*. While M&As in other industries were interrupted by the recession and the war in the Persian Gulf, restructuring continued unchecked in electronics, especially in telecommunications and computers.

A quick look at Europe's top 50 illustrates the extent of the changes: Top-ranked Siemens AG boosted its product range by buying Nixdorf Computers AG, for example, while number-two Philips regained some financial stability by ditching most of its computer operations. In the number-three spot, Alcatel-Alsthom now appears where Alcatel NV once stood. The new name reflects a web of international strategic alliances in telecommunications, energy, and transportation.

U.S. companies helped fuel the metamorphosis. Of the 163 cross-border acquisitions last year, U.S. companies accounted for 23, making them the most active non-European

acquirers of European electronics, electrical, and computer companies, according to Translink.

The rest of the deals revealed some interesting statistics among the European deal-workers:

- With 35 acquisitions, France's aggressive state-controlled companies topped Translink's list;
- Britain came in just behind France with 28 acquisitions. The country also managed to retain the number-two spot (behind Germany) as the most popular target for European M&A activity, suggesting that Britain remains a popular stepping-stone

for companies into the rest of Europe;

- Japanese companies made only nine acquisitions in 1990 but suffered a disproportionate political backlash. The reason: Many of their European targets—including International Computers Ltd. (ICL)—were seen as sacred cows;

- Although Germany was a hot-bed of M&A activity, German companies made relatively few deals, probably because of the distractions and costs associated with unification.

European computer companies accounted for a big percentage of the

*continued*

## Who is buying in Europe

Cross-border mergers and acquisitions of electronics companies

|                       | 1989               |                | 1990               |                | 1990<br>vs. 1989 |
|-----------------------|--------------------|----------------|--------------------|----------------|------------------|
|                       | Number<br>of deals | \$<br>millions | Number<br>of deals | \$<br>millions | %<br>change      |
| <b>Country buying</b> |                    |                |                    |                |                  |
| France                | 14                 | \$ 324         | 35                 | \$1,869        | 477%             |
| United States         | 23                 | 1,271          | 24                 | 1,616          | 27               |
| Japan                 | 5                  | 28             | 9                  | 1,530          | 446              |
| United Kingdom        | 26                 | 223            | 28                 | 512            | 130              |
| Netherlands           | 3                  | 187            | 16                 | 200            | 7                |
| Sweden                | 10                 | 22             | 14                 | 138            | 527              |
| Germany               | 7                  | 2,057          | 6                  | 69             | -97              |
| Switzerland           | 13                 | 85             | 18                 | 55             | -35              |

Currency conversion factor: U.S. \$1 = 1.28 ECUs

Source: Translink

## Motorola and PacTel exit European partnerships

**T**WO YEARS AGO, Motorola and Pacific Telesis (PacTel) each invested heavily in one of the three British consortia formed to create a new mobile-telephone market for Britain. The lure: Analysts estimated that each of three new personal communication networks (PCNs) could be worth up to \$3.5 billion. Yet shortly after joining consortia that bid for PCN licenses, both Motorola and PacTel cashed in their chips before losses mounted. What went wrong?

In fact, several things went wrong—U.S. players were overly enthusiastic, analysts were shaky about predicting consumer needs, and the British government allegedly sent out mixed signals. Most important, the tale highlights the perils of leaping too quickly into a European electronics marketplace transformed by the recent blitz of mergers, acquisitions, alliances, and deregulation.

Some blame the British regulatory authorities for the PCN fiasco. Britain had two analog cellular phone networks that were used mostly for business, but the three PCN networks were to offer cellular for the masses. The government decided the U.K. market could support all five networks. "The [British] Department of Trade and Industry must take a certain element of blame," says Nigel Cawthorne, editor of *The European Mobile Communications Report*. "Their ideas were a little half-baked."

Perhaps even a little sinister, according to Hugh Small, European director of Arthur D. Little in London, who suggests the government really wanted to promote competition against former monopoly holder British Telecommunications plc. "U.S. companies were almost used by the British government," he says.

Nonetheless, U.S. companies rushed to grab the three licenses by partnering with local Europe-

ans. By and large, the relationships were "marriages of convenience," says Small. "People were rushing to find partners and didn't care who they were, as long as they had the right political mix." Within six weeks of the formation of the consortia, Motorola had joined with Cable & Wireless (C&W), and Telefonica and PacTel had linked up with British Aerospace, Matra, and Millicom. U.S. West, meanwhile, partnered with STC and Thorn EMI.

The U.S. investors soon realized that PCN was not such a novelty after all. "It's just digital cellular," says Lee Cox, CEO of PacTel. Because the markets overlapped, he says, "all five networks would be selling basically the same product."

**I**N MAY 1991, PacTel sold its 25.3% stake in its PCN network to its co-investor British Aerospace. (PacTel remains active in building Europe's digital cellular market in Germany and Portugal.) In turn, British Aerospace sold its own stake to Hutchison Telecommunications Ltd.

Two months later, Motorola sold its 40% equity interest in Mercury Personal Communications Ltd. to C&W, Mercury's parent company. Mercury then merged operations—a move expected to save each consortium some \$680 million—with Unitel, the PCN network owned by U.S. West, STC (now Northern Telecom), and Thorn EMI.

U.S. West is the only U.S. company that didn't desert the PCN market as an operator. Motorola remains an equipment supplier to C&W and a heavy investor in the new European digital cellular standard known as GSM. PCN conforms to the GSM standard but will operate at a higher frequency than the digital mobile phone networks now being built in Europe.

The Motorola-PacTel incident highlights the frailties of market research. It also points out the limita-

tions that non-Europeans face when relying on local partners for guidance in a risky new market.

Earlier last year, Motorola had a much rosier view of the PCN market. In addition to its PCN license, Motorola supplied equipment to the analog cellular networks and invested in a new British factory to build digital cellular equipment. Motorola believed that the more subscribers there were—whether on PCNs or on mobile networks—the better for its equipment sales.

**E**VEN THOUGH it has sold its interest in the network, Motorola sources insist that the company hasn't lost interest in PCN opportunities. "Both C&W and Motorola agree the long-term future for PCN is bright," says Jerrold Adams, Motorola's director of PCN operations. Where Motorola and C&W differed was in the "short-term perceptions on the operational objectives," he says without elaboration (perhaps because Motorola remains an equipment supplier to C&W). He adds that Motorola has "not soured on partnerships, nor on the PCN market."

Still, the shakeout does call into question the inability of U.S. companies to correctly evaluate the market for new digital technology. One possible reason is that PCN is a mass-market item; unlike current mobile phones, PCN phones could be multicolored and chock-full of feature options. "Marketing to consumers is totally different [from current strategies]," says Don Burns, general manager of the European Cellular Subscriber Division.

The clincher for the U.S. companies was the realization, however late in the game, that they had invested too much in a developing market that already had too many competitors. "PCN is still a good business," says PacTel's Cox, "but not with five operators." □

## INTERNATIONAL

*continued*

**M&A blitz:** The U.K.'s Apricot Computers Ltd. sold out to Mitsubishi Electric Co., while Fujitsu picked up ICL. ICL, in turn, bought Finland's Nokia Data, and France's Groupe Bull snapped up the microcomputer unit of the United States' Zenith Electronics Corp. In Britain alone, computer and services mergers jumped 11% in 1990 to 138 deals, up from 124 in 1989, according to market researchers Broadview Associates in London.

The regroupings were driven by several factors, including the eagerness of non-European companies to gain a foothold in Europe and the fact that hardware manufacturers looking to increase European revenue from systems integration and software. Many of the deals, however, were triggered by weaker computer makers' lack of critical mass and inability to continue alone in the battered computer market. By providing financial stability and wider market reach, the deal-making ostensi-

bly strengthened such European companies as ICL and Nixdorf.

Still, deal makers seemed optimistic. The cardinal rule of mergers, for example, holds that the best corporate marriages are between healthy companies. That didn't stop Digital Equipment Corp. (DEC) from snap-

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**Americans don't seem  
to understand why  
so many European  
computer makers  
go under**

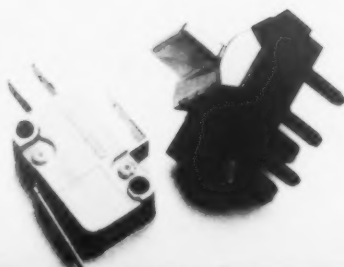
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ping up Philips's bleeding computer unit, however, or Siemens from grabbing the ailing Nixdorf. A year after the Nixdorf purchase, Siemens Nixdorf Informationssysteme announced a loss of almost \$600 million due to restructuring costs. SNI had hoped to be profitable in 1991.

Nor is everyone sold on Digital Equipment's European strategy. True, DEC obtained market share by buying a sick company for only one-third of its sales, but given DEC's own weak position—the company eliminated some 12,000 jobs and took a \$1.1 billion charge in fiscal 1991—some analysts admit to being confused. The Philips unit had “a reasonably sized installed base that wasn't going to grow,” says CS First Boston analyst Kevin Brau in London. Adds Roger Cooper, vice president and general manager of Sequent Europe, “I don't think Americans understand the reasons behind the failures of European computer companies.” One of those reasons, he says: the costly labor and social benefits that are shouldered by European companies.

On another front, deregulation and new technologies signaled the rebirth of Europe's telecommunications market last year. As in computers, the industry responded with a

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## INTERNATIONAL

frenzy of M&A deal-making designed to increase the players' market shares, create critical mass, and forge new relationships across old political boundaries.

One example was Northern Telecom's purchase of STC plc, the British equipment maker, as an entry into the British equipment market and as a European base to counter-attack the rival AT&T Corp.'s own European strategy. With GEC plc, telecom heavyweight Siemens also picked up British equipment maker GPT plc. For now, the purchase gives Siemens a shot as a supplier to British Telecommunications plc; long-term, Siemens probably will sell out to GEC.

AT&T, itself, made inroads into Europe by scooping up Istel plc, Britain's big EDI and services company, which AT&T hopes will boost both European revenue from electronic messaging and British sales of AT&T computers. AT&T also bought 20% of Italtel SpA in 1989

as a springboard into the European telecom equipment market.

Another deal—last October's cross-shareholding agreement between Fiat subsidiary Telettra and Alcatel-Alsthom—delivered both geographic benefits and the potential for product integration in telecom-

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**Some of the European deals, such as the Siemens-Nixdorf merger, seemed positively bizarre by most standards**

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munications, as well as in artificial intelligence, robotics, avionics, and components. The transaction is important in Europe because it gives Telettra the financial muscle to move outside its home turf of Italy and Spain. It also gives Alcatel a bigger stake in the French transmission

market and a stronger position in the world cable transmission market dominated by AT&T, Siemens, and Fujitsu.

Telettra had been on the block for years. The leading suitor was the Italian government, which wanted to merge the equipment maker into its state telecommunications holdings. The deal was a blow to non-European equipment makers; if Telettra had become government-owned, for example, AT&T would have had stronger links to the state telecom market through its 20% stake in Italtel. In the end, Italian infighting blocked the deal and stymied other suitors, including Siemens, NEC, Fujitsu, and AT&T.

The restructuring in European telecom has taught U.S. companies to move cautiously into European markets. Many companies have already learned that, for all its opportunities, the restructuring of Europe's top electronics companies can bring heartache as well. □

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## Sales were up, but profits nosedived

Productivity among the European top 50 jumped 22% last year. Alas, the rest of the numbers weren't nearly as cheery

By Linda Stallmann

**D**espite higher sales, 1990 was a disappointing year for Europe's top 50 electronics companies. Electronics sales rose 24% to \$179 billion, from \$144 billion the year before. Profits fell 26%, however, to just over \$13 billion due to exchange-rate movement and restructuring and employee-reduction charges. In 1990 the top 50's profit margin came in at just 2.4%—a big drop from the 4.5% margin of the year before. By comparison, the 50 top U.S. electronics companies posted a 4.9% margin last year.

As a group, the European companies did manage to improve their productivity as measured by sales per employee. In 1990 the average productivity reached \$130,600, a 22% increase over last year's \$107,500 rate, but still well below the average \$154,600 logged by the top 50 U.S. companies. This measure should rise even further during the next year as many European

companies, like their U.S. counterparts, cut their work forces to become more competitive.

Another way to strengthen competitiveness is through capital spending and R&D investment. The European top 50 increased R&D expenditures by 23% to \$28 billion. As a percentage of total sales, however, that was only 5.1% in 1990, down from 5.7% the year before. Capital expenditures fell, too, from 7.9% of sales in 1989 to 7.0% last year. The top 50 U.S. companies invested 5.5% of their sales in R&D and 7.6% in new plant and equipment.

**S**EVERAL OF Europe's top electronics companies were adversely affected by sluggish economic conditions in key markets, exchange-rate fluctuation, and restructuring. One of the biggest changes was at the very top of the list, with Siemens replacing Philips as the top European electronics company in terms of electronics revenue.

Siemens's electronics sales rose 12% to more than \$25 billion, while Philips's sales tumbled 3% to \$23.8 billion. For Philips, changes in top management and radical reorganization resulted in a loss of more than \$2.4 billion. "The realization that Philips was vulnerable and might not last forever came as a great shock both inside and outside the company," said Philips president J. D. Timmer.

Other European companies hit by sliding sales and earnings include Ferranti International, where sales dropped by 12% and profits by a whopping 69%. At STC, which has since been acquired by Northern Telecom, revenue dropped 12% to \$4.1 billion due to lower turnover in the company's information and communications systems operations.

Meanwhile, GEC's acquisitions of Plessey and Ferranti's businesses increased its electronics sales by 24%, to \$10.4 billion, even though the recession trimmed earnings from

the previous year. The biggest rise in electronics sales was the 302% gain by Leica, which was formed by the merger of Wild Leitz Holding AG and The Cambridge Instrument Co. Their integration created a \$993 million company. ☐

### European vs. U.S. electronics companies

|                                 | Europe's top 50 |           | U.S.'s top 50 |           |
|---------------------------------|-----------------|-----------|---------------|-----------|
|                                 | 1989            | 1990      | 1989          | 1990      |
| Electronics sales (\$ billions) | \$144.2         | \$178.9   | \$272.6       | \$292.2   |
| Total sales (\$ billions)       | \$401.5         | \$553.2   | \$610.9       | \$647.7   |
| Net income (\$ billions)        | \$18.2          | \$13.5    | \$31.4        | \$31.7    |
| Net income/sales                | 4.5%            | 2.4%      | 5.1%          | 4.9%      |
| R&D/sales                       | 5.7%            | 5.1%      | 5.7%          | 5.5%      |
| Capital expenditures/sales      | 7.9%            | 7.0%      | 8.1%          | 7.6%      |
| Non-European sales/sales*       | NA              | 25.6%     | 34.9%         | 37.1%     |
| Sales/employee                  | \$107,465       | \$130,604 | \$140,245     | \$154,598 |

\*Sales outside of Europe for top 50 European and sales outside U.S. for top 50 U.S. companies

Source: ELECTRONIC BUSINESS

# Top 50 European electronics companies

| 1990<br>Rank | Company                      | Location             | Electronics sales<br>(\$ millions) |                             | Total sales<br>(\$ millions) |                             | 5-year sales<br>growth* |        | Net income<br>(\$ millions) |                             |
|--------------|------------------------------|----------------------|------------------------------------|-----------------------------|------------------------------|-----------------------------|-------------------------|--------|-----------------------------|-----------------------------|
|              |                              |                      |                                    | % change<br>from prior year |                              | % change from<br>prior year |                         |        |                             | % change from<br>prior year |
| 1            | Siemens                      | Germany              | \$25,044                           | 11.6%                       | \$37,321                     | 3.4%                        | 3.0%                    | \$985  | 5.8%                        |                             |
| 2            | Philips                      | Netherlands          | 23,846                             | -2.9                        | 30,640                       | -2.6                        | -1.5                    | -2,487 | -671.5                      |                             |
| 3            | Alcatel Alsthom              | France               | 14,233                             | -8.2                        | 26,456                       | .1                          | 13.0                    | 943    | 4.0                         |                             |
| 4            | Thomson                      | France               | 13,482                             | 3.0                         | 13,816                       | -1.9                        | 4.7                     | -454   | -597.8                      |                             |
| 5            | GEC plc                      | Britain              | 10,406                             | 23.7                        | 17,430                       | 7.9                         | 11.3                    | 923    | -7.6                        |                             |
| 6            | Robert Bosch                 | Germany              | 7,983                              | 3.8                         | 19,693                       | 4.0                         | 8.4                     | 346    | -10.6                       |                             |
| 7            | Olivetti                     | Italy                | 7,392                              | -1.9                        | 7,543                        | .1                          | 8.0                     | 50     | -70.2                       |                             |
| 8            | Ericsson                     | Sweden               | 7,118                              | 18.0                        | 7,720                        | 15.6                        | 7.1                     | 583    | 87.2                        |                             |
| 9            | Groupe Bull                  | France               | 6,351                              | 5.7                         | 6,351                        | 5.7                         | 16.5                    | -1,247 | NM                          |                             |
| 10           | Nokia                        | Finland              | 4,396                              | 15.8                        | 5,780                        | -2.9                        | 15.0                    | 90     | 25.5                        |                             |
| 11           | STC                          | Britain              | 4,078                              | -11.9                       | 4,078                        | -11.9                       | 2.8                     | 96     | -69.3                       |                             |
| 12           | IRI                          | Italy                | 3,834                              | 10.2                        | 61,391                       | 10.2                        | 7.8                     | 925    | 26.5                        |                             |
| 13           | British Telecom              | Britain              | 3,618                              | 14.2                        | 24,180                       | 6.8                         | 9.6                     | 3,824  | 37.8                        |                             |
| 14           | Asea Brown Boveri            | Switzerland          | 3,500                              | 30.6                        | 26,688                       | 29.8                        | NA                      | 590    | .2                          |                             |
| 15           | AEG                          | Germany              | 3,257                              | 1.2                         | 8,137                        | 7.4                         | 3.9                     | -127   | -174.5                      |                             |
| 16           | Grundig                      | Germany              | 2,887                              | 20.0                        | 2,887                        | 20.0                        | 9.3                     | 121    | 29.1                        |                             |
| 17           | Bayer                        | Germany              | 2,647                              | 19.0                        | 25,769                       | -3.8                        | -1.9                    | 1,178  | -10.1                       |                             |
| 18           | Fiat                         | Italy                | 2,504                              | 30.5                        | 47,752                       | 10.0                        | 15.7                    | 1,346  | -51.0                       |                             |
| 19           | Ascom                        | Switzerland          | 2,128                              | 11.6                        | 2,128                        | 11.6                        | NA                      | 37     | 2.6                         |                             |
| 20           | Racal Electronics            | Britain              | 2,022                              | -4.8                        | 3,831                        | 5.6                         | 10.5                    | 200    | -7.1                        |                             |
| 21           | Matra                        | France               | 2,000                              | 7.9                         | 4,471                        | 10.2                        | 10.4                    | 111    | 0.2                         |                             |
| 22           | Memorex Telex                | Netherlands          | 1,870                              | -5.7                        | 1,870                        | -5.7                        | 19.2                    | -274   | NM                          |                             |
| 23           | Mannesmann                   | Germany              | 1,772                              | 14.2                        | 14,816                       | 7.2                         | 5.2                     | 294    | -5.9                        |                             |
| 24           | Cap Gemini                   | France               | 1,683                              | 30.1                        | 1,683                        | 30.1                        | 32.8                    | 114    | 19.0                        |                             |
| 25           | Schlumberger                 | Netherlands Antilles | 1,580                              | 5.3                         | 5,306                        | 13.2                        | -1.0                    | 570    | 35.8                        |                             |
| 26           | SGS-Thomson Microelectronics | Netherlands          | 1,350                              | 13.5                        | 1,350                        | 13.5                        | NA                      | -97    | NM                          |                             |
| 27           | Oce-van der Grinten          | Netherlands          | 1,265                              | 9.1                         | 1,265                        | 9.1                         | 3.4                     | 47     | 1.2                         |                             |
| 28           | British Aerospace            | Britain              | 1,234                              | 19.2                        | 18,721                       | 16.0                        | 31.4                    | 462    | 11.6                        |                             |
| 29           | Thorn EMI                    | Britain              | 1,162                              | 5.4                         | 6,728                        | -1.5                        | 2.0                     | 306    | -18.0                       |                             |
| 30           | Ciba-Geigy                   | Switzerland          | 1,023                              | -18.6                       | 14,175                       | -4.4                        | 1.6                     | 743    | -33.7                       |                             |
| 31           | Leica                        | Britain              | 993                                | 301.8                       | 993                          | 301.8                       | 56.4                    | 2      | -81.3                       |                             |
| 32           | Amstrad                      | Britain              | 939                                | -7.8                        | 939                          | -7.8                        | 33.5                    | 56     | -32.8                       |                             |
| 33           | Ferranti International       | Britain              | 842                                | -42.4                       | 842                          | -42.4                       | -5.1                    | -186   | NM                          |                             |
| 34           | Smith Industries             | Britain              | 841                                | -6.7                        | 1,103                        | -4.5                        | 11.9                    | 131    | 8.5                         |                             |
| 35           | Nobel Industries             | Sweden               | 823                                | 26.5                        | 4,459                        | 19.5                        | NA                      | 199    | -14.6                       |                             |
| 36           | Lucas Industries             | Britain              | 820                                | 19.6                        | 3,654                        | 6.8                         | 7.0                     | 238    | 1.3                         |                             |
| 37           | Lex Service                  | Britain              | 806                                | -12.3                       | 3,188                        | -10.3                       | 11.5                    | 9      | -87.0                       |                             |
| 38           | BICC                         | Britain              | 764                                | 0.0                         | 6,909                        | 2.6                         | 13.0                    | 195    | -5.2                        |                             |
| 39           | Swedish Telecom              | Sweden               | 743                                | NA                          | 5,307                        | 15.4                        | NA                      | 31     | -8.9                        |                             |
| 40           | Dassault                     | France               | 736                                | -2.6                        | 736                          | -2.6                        | 8.4                     | -8     | -132.4                      |                             |
| 41           | BASF                         | Germany              | 718                                | 2.5                         | 28,851                       | -2.1                        | 1.0                     | 685    | -45.0                       |                             |
| 42           | Oerlikon-Bührle              | Switzerland          | 604                                | -6.7                        | 3,370                        | -1.3                        | -0.7                    | -66    | NM                          |                             |
| 43           | Siebe                        | Britain              | 551                                | 32.2                        | 2,722                        | 7.9                         | 31.9                    | 164    | -16.2                       |                             |
| 44           | Cable and Wireless           | Britain              | 542                                | -4.3                        | 4,766                        | 11.9                        | 17.6                    | 616    | 2.3                         |                             |
| 45           | Sema                         | Britain              | 497                                | NA                          | 667                          | 28.1                        | NA                      | 17     | -8.2                        |                             |
| 46           | Electrocomponents            | Britain              | 493                                | 3.1                         | 764                          | 5.3                         | 15.8                    | 66     | -5.1                        |                             |
| 47           | Hoechst                      | Germany              | 473                                | -31.6                       | 27,761                       | -2.3                        | 1.0                     | 1,050  | -20.4                       |                             |
| 48           | SD-Scicon                    | Britain              | 456                                | -10.2                       | 456                          | -10.3                       | NA                      | -41    | NM                          |                             |
| 49           | Unitech                      | Britain              | 452                                | 8.1                         | 470                          | 8.3                         | 7.3                     | 20     | 2.3                         |                             |
| 50           | Krupp                        | Germany              | 436                                | -6.3                        | 9,635                        | -12.8                       | NA                      | 134    | NM                          |                             |

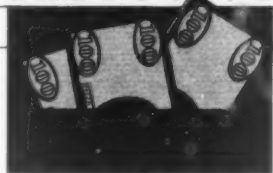
Electronics sales: Either a published figure or an ELECTRONIC BUSINESS estimate of the revenue earned by each company from sales of electronics products and services

\* compounded average annual growth rate (% per year)

| 1990<br>net income<br>% of sales | Return on<br>investment | Debt to<br>capital | Sales per<br>employee | R&D %<br>of sales | Capital<br>expenditures<br>% of sales | Foreign sales<br>% of sales | Sales outside<br>Europe<br>% of sales | Fiscal year<br>ended |
|----------------------------------|-------------------------|--------------------|-----------------------|-------------------|---------------------------------------|-----------------------------|---------------------------------------|----------------------|
| 2.6%                             | 7.7%                    | 18.8%              | \$100,057             | 11.0%             | 6.9%                                  | 55.0%                       | 25.0%                                 | 9/90                 |
| -8.1                             | -14.5                   | 57.7               | 112,315               | 7.9               | 5.1                                   | 93.5                        | 39.1                                  | 12/90                |
| 3.6                              | 6.0                     | 44.3               | 128,740               | 8.4               | 4.9                                   | 62.6                        | 21.8                                  | 12/90                |
| -3.3                             | -5.6                    | 54.4               | 131,007               | 6.0               | 5.6                                   | 70.3                        | 45.3                                  | 12/90                |
| 5.3                              | 15.6                    | 15.3               | 147,054               | 4.6               | 2.7                                   | 58.7                        | 33.0                                  | 3/91                 |
| 1.8                              | 6.7                     | 21.0               | 109,628               | 6.4               | 8.8                                   | 51.0                        | 16.8                                  | 12/90                |
| 0.7                              | 0.7                     | 62.1               | 140,515               | 5.2               | 4.6                                   | 63.4                        | 18.5                                  | 12/90                |
| 7.5                              | 15.7                    | 24.0               | 109,911               | 10.7              | 7.5                                   | 82.0                        | 41.0                                  | 12/90                |
| -19.6                            | -59.7                   | 109.3              | 142,790               | 8.6               | 6.5                                   | NA                          | 30.3                                  | 12/90                |
| 1.6                              | 2.1                     | 51.5               | 154,799               | 5.3               | 4.8                                   | 55.3                        | 15.8                                  | 12/90                |
| 2.4                              | 5.4                     | 1.8                | 121,468               | 11.3              | 4.2                                   | 31.4                        | 17.9                                  | 12/90                |
| 1.5                              | NA                      | NA                 | 146,170               | NA                | NA                                    | NA                          | NA                                    | 12/90                |
| 15.8                             | 13.2                    | 32.3               | 90,427                | 1.8               | 21.0                                  | NA                          | NA                                    | 3/91                 |
| 2.2                              | 5.2                     | 62.5               | 124,041               | 7.2               | 3.6                                   | 96.0                        | 42.9                                  | 12/90                |
| -1.6                             | -2.2                    | 77.7               | 105,742               | 5.9               | 5.3                                   | 44.0                        | 22.2                                  | 12/90                |
| 4.2                              | 19.1                    | 2.1                | 132,754               | 3.4               | 5.7                                   | 47.9                        | 2.7                                   | 3/91                 |
| 4.6                              | 9.1                     | 24.1               | 150,697               | 6.6               | 8.9                                   | 79.5                        | 40.2                                  | 12/90                |
| 2.8                              | 4.0                     | 58.7               | 157,473               | 3.9               | 7.4                                   | 43.6                        | 9.0                                   | 12/90                |
| 1.8                              | 3.0                     | 40.3               | 131,840               | 8.3               | 7.5                                   | 41.9                        | 10.0                                  | 12/90                |
| 5.2                              | 7.5                     | 36.1               | 99,619                | 4.6               | 10.8                                  | 50.0                        | 34.0                                  | 3/91                 |
| 2.5                              | 5.2                     | 56.6               | 227,972               | 2.1               | NA                                    | 45.2                        | NA                                    | 12/90                |
| -14.7                            | -28.3                   | 134.7              | 219,994               | 2.6               | 1.4                                   | 98.4                        | 56.3                                  | 3/91                 |
| 2.0                              | 7.0                     | 9.5                | 118,132               | 2.9               | 5.4                                   | 59.8                        | 27.3                                  | 12/90                |
| 6.8                              | 8.4                     | 65.9               | 102,062               | NA                | NA                                    | 57.8                        | 13.0                                  | 12/90                |
| 10.7                             | 14.1                    | 19.7               | 106,124               | 7.0               | 12.7                                  | 87.3                        | 59.7                                  | 12/90                |
| -7.2                             | -6.9                    | 65.0               | 63,380                | 16.1              | 19.3                                  | NA                          | 38.6                                  | 12/90                |
| 3.7                              | 5.1                     | 43.3               | 112,281               | 6.9               | 15.6                                  | 90.2                        | 18.3                                  | 11/90                |
| 2.5                              | 6.5                     | 28.7               | 146,373               | 2.1               | 7.9                                   | 65.2                        | 42.0                                  | 12/90                |
| 4.5                              | 11.6                    | 37.5               | 116,145               | 3.3               | 13.4                                  | 54.3                        | 27.3                                  | 3/91                 |
| 5.2                              | 5.1                     | 22.3               | 150,570               | 10.4              | 10.4                                  | 98.1                        | 55.0                                  | 12/90                |
| 0.2                              | 0.4                     | 63.9               | 100,548               | 7.5               | 4.8                                   | NA                          | 38.1                                  | 3/91                 |
| 5.9                              | 10.6                    | 4.1                | 706,881               | NA                | 2.1                                   | 56.5                        | 7.8                                   | 6/90                 |
| -22.1                            | -47.8                   | 46.8               | 46,333                | 1.7               | 2.3                                   | 39.7                        | 35.6                                  | 3/91                 |
| 11.9                             | 23.1                    | 13.3               | 82,010                | 16.0              | 3.5                                   | 47.4                        | 55.6                                  | 7/90                 |
| 4.5                              | 4.8                     | 73.6               | 167,303               | NA                | 9.2                                   | 70.4                        | 20.6                                  | 12/90                |
| 6.5                              | 11.8                    | 32.8               | 63,661                | 4.4               | 6.1                                   | 81.1                        | 41.6                                  | 7/90                 |
| 0.3                              | 1.6                     | 33.4               | 399,239               | NA                | 1.9                                   | NA                          | 18.5                                  | 12/90                |
| 2.8                              | 12.1                    | 27.1               | 155,691               | 0.6               | 2.6                                   | 50.0                        | 39.6                                  | 12/90                |
| 0.6                              | 0.6                     | 39.1               | 110,621               | 3.8               | 32.1                                  | NA                          | NA                                    | 12/90                |
| -1.1                             | -5.6                    | 5.9                | 169,831               | 7.0               | 4.6                                   | 26.2                        | NA                                    | 12/90                |
| 2.4                              | 6.2                     | 19.0               | 215,217               | 4.4               | 9.6                                   | 65.8                        | 32.8                                  | 12/90                |
| -1.9                             | -2.1                    | 54.9               | 127,481               | 4.4               | 7.9                                   | NA                          | NA                                    | 12/90                |
| 6.0                              | 6.6                     | 53.6               | 83,108                | 3.7               | 3.4                                   | 89.8                        | 61.3                                  | 3/91                 |
| 12.9                             | 9.9                     | 19.6               | 120,894               | NA                | 31.8                                  | NA                          | 67.5                                  | 3/91                 |
| 2.5                              | 10.9                    | 40.9               | 88,659                | 3.4               | 4.1                                   | 67.0                        | 1.5                                   | 12/90                |
| 8.6                              | 24.4                    | 26.3               | 185,927               | NA                | 5.5                                   | 27.4                        | 12.9                                  | 3/91                 |
| 3.8                              | 8.8                     | 33.5               | 160,571               | 6.0               | 7.6                                   | 74.6                        | 38.1                                  | 12/90                |
| -9.0                             | -40.8                   | 40.8               | 96,175                | 1.0               | 10.8                                  | 56.1                        | 10.6                                  | 12/90                |
| 4.2                              | 7.8                     | 61.3               | 79,372                | 4.3               | 5.4                                   | 80.0                        | 55.0                                  | 5/90                 |
| 1.4                              | 7.6                     | 62.5               | 159,630               | 1.5               | 4.6                                   | 49.9                        | 29.2                                  | 12/90                |

All figures shown are based on the latest available completed fiscal year; thus a variety of accounting periods are represented. Similarly, the electronics sales and other financial information has been converted to dollars using an exchange rate that consists of the average rate during each company's fiscal year.

NA = not available  
NM = not meaningful



# How much more (\$) can they take?

Who made the most in 1990, who lost the most, and when in the world will it ever end?

By Quang Bao

**T**he men at the top of the electronics industry made more money than ever last year. An ELECTRONIC BUSINESS survey puts the average pay for the 100 top-paid executives at \$998,582 in 1990, \$108,317 more than the 1989 average. Membership in last year's million-dollar club rose to 34, up from 20 in 1989.

To understand how fat the paychecks have become for top electronics managers, the executive at the bottom of this year's list would have ranked 13th on our 1983 list. Since 1985, in fact, the compounded average annual growth rate for electronics executives' salaries has run at 12.4%, compared with only 6.2% for electronics sales.

Interestingly, no women appear in this year's top 100. The highest-paid woman on the survey was Carole F. St. Mark from Pitney Bowes. Her \$454,457 landed her at the number-180 slot.

The two stars of the survey are Bernard L. Schwartz, 64, CEO of Loral Corporation, and John Sculley, 51, CEO of Apple Computer. Loral modified Schwartz's incentive compensation, netting him \$1.3 million; add to that his increased base pay of \$785,000 and a bonus package worth over \$1 million, and Schwartz leads the pack with a total of \$3.2 million. Schwartz is the first executive to break the \$3 million mark since we've been tracking executive compensation. Sculley's earnings (\$2.2

million this year) places him year after year near the top of the list. He has graced the top spot in our survey five times during the nine years we've been conducting the survey.

The 1990 list also boasts 26 new executives. That may be due in part to last year's overall sales increase among the industry's top 200 companies (see ELECTRONIC BUSINESS, July 22, 1991), which translates into more money for managers whose compensation hinges on company performance. "What a company makes should be a strong indicator of what their executives make," says James Foushee of The Foushee Group Inc., a compensation consulting firm in Burlingame, Calif.

One company that paid according to performance was Conner Peripherals, where sales increased from \$257 million in 1988 to \$1.3 billion in 1990. During the same period, the

salaries of the top five executives almost doubled, putting them all on our list. IBM, Litton Industries, and Xerox also produced five executives for this year's list. Apple Computer, Compaq, and Honeywell each produced four, and several companies had three. Lotus president Jim Manzi, meanwhile, took a 12.5% cut last year, reflecting the company's meager 7.5% return on equity.

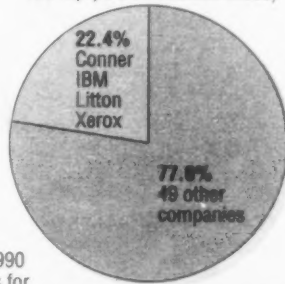
On the flip side is Richard W. Miller, chairman and CEO for Wang Laboratories, and Dean O. Morton, COO for Hewlett Packard. Wang's revenues decreased by 14.2%, dropping Miller's salary by 12.5% and bumping him out of the million dollar club. Despite a sales increase of 11%, HP's earnings also declined by 11%, sliding Morton out of the club with his 4% pay cut.

Executive salaries, however, aren't always tied to how the company is doing, notes Foushee. One exec who bucked the trend is Stewart Carrell, chairman of Diasonics. Carrell took the biggest pay cut (37.4%), despite the fact that net sales for Diasonics rose by 38% in 1990. Fourteen other execs on our list took a salary cut last year.

What makes these guys so valuable? There is no easy answer, notes Foushee, but one reason for the big bucks is the lack of salary standards. "You have young, talented people who start small companies and pay their executives according to what billion-dollar companies pay," explains Foushee,

## Who's tops in executive pay?

(% of total salaries for 100 top-paid electronics execs)



Total 1990 salaries for top 100 = \$99.9 million

Source: ELECTRONIC BUSINESS

## Paycheck heroes, paycheck zeros

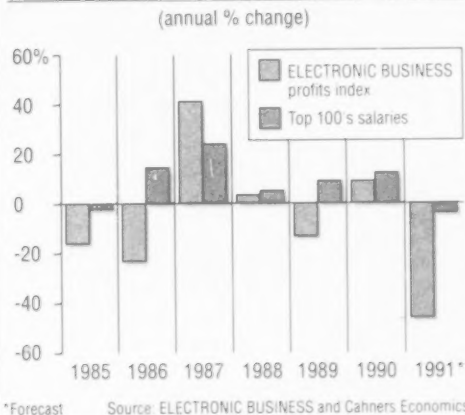
Industry experts may blast top-paid executives for making too much during sluggish times, but ELECTRONIC BUSINESS found that most executives earned it. Unlike executives' salaries in other industries, the paychecks of the executives in the electronics industry make sense. Profits—or lack of profits—do, in fact, drive pay.

George M. Scalise, chief executive for Maxtor, more than tripled his company's profits in 1990. Therefore, his salary tripled. Alan F. Shugart, chief executive of Seagate Technology, took his company's profits from a scant \$349,000 in 1989 to \$117 million in 1990. Needless to say, Shugart got a raise.

On the other

hand, Applied Materials chief executive James Morgan's salary plunged to reflect the company's 23% shrinkage in sales and 119% in profits. AMD chairman W. J. Sanders took a 25% salary cut last year after his company swallowed a 216% decline in profits. □

### Profits do drive executive pay



and since there is a limited number of managers to run electronics companies, qualified executives feel justified in demanding bigger bucks. "They basically write their own paychecks based on what other top guys are making," he says. "The industry isn't mature enough to know what fair compensation is."

Inclusion in this high-profile club is becoming more of a problem than a privilege, says Foushee. The reason is that employees perceive their bosses as caring more about making money for themselves than about workers and their companies. The perception is so widespread, in fact, that Tim Schwartz of Western Management Group, a research and survey firm in Los Gatos, Calif., dismisses the million-dollar execs as "a club full of ninnyes."

Some experts predict that salaries are due to level off. Executive com-

pensation in companies with 500 employees or less is already decelerating, according to Roger Stabile, director of surveys for the American Electronics Association—not just because of the recession, but "because people are becoming more sensitive and more responsive to criticism from managers who have to lay off workers."

Schwartz says that future compensation packages should have a profitability factor that needs to be taken into account. "A company should tell an executive that his next pay raise will be effective when he is," he says.

Michael Cleary of Joiner Associates in Madison, WI argues that executives should be subjected to the same kind of evaluations as their employees. "If you base employee bonuses on meeting a deadline or decreasing the number of rejects, then why can't you set a mark for execu-

tives to reach?" he asks. "The message you're sending out in the end is that I'm okay; you're not okay. I'm okay but you need standards."

Foushee also predicts a "salary revolution" in the next two or three years, suggesting that top dogs could set an example for other executives by taking large pay cuts to boost company morale. "I see the board of directors getting more involved with excess pay and giving a much more prudent review of how they are going to reward their executives," says Foushee. Another method to determine salaries is to hire a professional arbitrator to lay out a fair compensation plan, a tack that companies such as Apple and Mass Par Computer have already taken.

Electronics executives' salaries have a long way to go before they reach the heights of their peers in other industries. Sun Microsystems president Scott McNealy, for example, is 12th on our list but appears on *Forbes's* "lowest paid" list. Apple's Sculley, in fact, is the only electronics executive to make it near the top of *Forbes's* best-paid executives survey. As salaries are increasingly publicized, moreover, the ante will be raised as executives performing the same work in other companies wonder why they aren't being paid the same.

To Schwartz of the Western Management Group, though, it doesn't much matter how well an executive does his or her job. No one can justify making that much money. "It's a crime what they're paying these guys," he says. "Somehow, it's got to end." □

*Compensation data for electronics' 100 top-paid executives, taken from the companies' latest proxy statements, includes salaries and bonuses but not stock options. The survey was limited to publicly held companies in which electronics accounts for 50% or more of total sales.*

## EXECUTIVE



## COMPENSATION

| Rank | Executive/age           | 1990<br>cash<br>compensa-<br>tion | %<br>change<br>from<br>1989 | Company             | Position                               |
|------|-------------------------|-----------------------------------|-----------------------------|---------------------|----------------------------------------|
| 1    | Bernard L. Schwartz/64  | \$3,212,635                       | 84.4%                       | Loral               | Chairman, CEO                          |
| 2    | Joseph R. Canion/46     | 2,327,160                         | 10.0                        | Compaq Computer     | President, CEO                         |
| 3    | John Sculley/51         | 2,198,866                         | -2.3                        | Apple Computer      | Chairman, CEO                          |
| 4    | John F. Akers/56        | 2,028,400                         | 42.8                        | IBM                 | Chairman                               |
| 5    | Charles B. Wang/45      | 1,956,512                         | 9.1                         | Computer Associates | Chairman, CEO                          |
| 6    | Anthony W. Wang/47      | 1,683,512                         | 10.7                        | Computer Associates | President, COO                         |
| 7    | Lawrence J. Ellison/46  | 1,599,756                         | -7.8                        | Oracle              | President, CEO                         |
| 8    | Frank C. Lanza/58       | 1,568,333                         | 70.6                        | Loral               | President, COO                         |
| 9    | John A. Young/58        | 1,498,360                         | -5.4                        | Hewlett-Packard     | President, CEO                         |
| 10   | David T. Mitchell/48    | 1,485,553                         | 69.9                        | Seagate Technology  | President, COO                         |
| 11   | James J. Renier/61      | 1,469,323                         | 7.6                         | Honeywell           | Chairman, CEO                          |
| 12   | Scott G. McNealy/35     | 1,406,600                         | 80.0                        | Sun Microsystems    | Chairman, President & CEO              |
| 13   | Alan F. Shugart/59      | 1,406,273                         | 84.3                        | Seagate Technology  | Chairman, CEO                          |
| 14   | Finis F. Conner/47      | 1,405,158                         | 99.6                        | Conner Peripherals  | Chairman, CEO                          |
| 15   | Thomas L. Phillips/66   | 1,340,002                         | NA                          | Raytheon            | Chairman, CEO                          |
| 16   | Orion L. Hoch/61        | 1,336,099                         | NA                          | Litton Industries   | President, CEO, Director               |
| 17   | Eckhard Pfeiffer/49     | 1,335,612                         | 34.8                        | Compaq Computer     | President, Europe & International      |
| 18   | Jack D. Kuehler/58      | 1,307,760                         | 42.4                        | IBM                 | President                              |
| 19   | Michael H. Spindler/48  | 1,303,433                         | 60.7                        | Apple Computer      | President, COO                         |
| 20   | David T. Kearns/60      | 1,297,702                         | -2.7                        | Xerox               | Chairman, CEO                          |
| 21   | William J. Almon/58     | 1,277,591                         | 111.7                       | Conner Peripherals  | President, COO                         |
| 22   | Jean-Louis Gasse*       | 1,230,173                         | 51.7                        | Apple Computer      | Sr. VP                                 |
| 23   | Ryal R. Poppa/57        | 1,207,574                         | 30.5                        | Storage Technology  | Chairman, President & CEO              |
| 24   | Paul A. Allaire/52      | 1,197,294                         | 30.7                        | Xerox               | President                              |
| 25   | Charles E. Exley Jr./61 | 1,194,995                         | 2.5                         | NCR                 | Chairman, CEO                          |
| 26   | Douglas K. Mahon/49     | 1,186,987                         | 48.2                        | Seagate Technology  | Executive VP, Chief Technical Officer  |
| 27   | Michael R. Hallman      | 1,169,393                         | NA                          | Microsoft           | President, COO                         |
| 28   | J. J. Adorjan/52        | 1,144,807                         | NA                          | ESCO                | Chairman, CEO                          |
| 29   | Leon Machiz/66          | 1,142,736                         | 23.4                        | Avnet               | Chairman, CEO                          |
| 30   | John T. Hartley/60      | 1,109,578                         | 3.1                         | Harris              | Chairman, President, CEO               |
| 31   | George M. Scalise/56    | 1,081,305                         | 217.2                       | Maxtor              | President, CEO                         |
| 32   | Joseph L. Parkinson/45  | 1,053,622                         | 1.8                         | Micron Technology   | Chairman, CEO                          |
| 33   | Ian Dier                | 1,049,419                         | NA                          | Apple Computer      | Sr. VP, Pres. Apple Pacific            |
| 34   | John C. Lewis/55        | 1,031,148                         | 19.2                        | Amdahl              | Chairman, CEO                          |
| 35   | Kenneth H. Olsen/64     | 982,452                           | 3.5                         | Digital Equipment   | President, Director                    |
| 36   | John P. Squires/43      | 980,881                           | 100.9                       | Conner Peripherals  | Executive VP                           |
| 37   | Wesley E. Cantrell/56   | 976,076                           | NA                          | Harris              | Pres. Lanier Worldwide                 |
| 38   | Geoffrey W. Squire      | 971,827                           | 108.6                       | Oracle              | Exec. VP, Pres. Worldwide Distribution |
| 39   | Frank A. Metz Jr./57    | 970,607                           | 43.2                        | IBM                 | Senior VP                              |
| 40   | Dean O. Morton/58       | 962,728                           | -4.0                        | Hewlett-Packard     | Executive VP, COO, Director            |
| 41   | E. Joseph Zemke/50      | 933,540                           | 62.5                        | Amdahl              | President, COO, Director               |
| 42   | George M. Fisher/50     | 931,347                           | 19.9                        | Motorola            | CEO, President                         |
| 43   | C. Michael Armstrong    | 929,100                           | 36.6                        | IBM                 | Senior VP                              |
| 44   | T. R. Lautenbach        | 929,100                           | 36.6                        | IBM                 | Senior VP                              |
| 45   | Dennis J. Picard/58     | 925,002                           | NA                          | Raytheon            | President, Director                    |
| 46   | James L. Donald/59      | 909,917                           | 15.6                        | DSC Communications  | Chairman, President, CEO               |
| 47   | Michael Swavely/37      | 902,134                           | 19.3                        | Compaq Computer     | President, North America               |
| 48   | Lawrence P. .../52      | 900,000                           | 36.8                        | Control Data        | President, CEO                         |
| 49   | E. Gene Keiffer/61      | 884,152                           | 17.5                        | E-Systems           | Chairman, CEO                          |
| 50   | Richard W. .../49       | 875,487                           | -12.5                       | Wang Laboratories   | Chairman, President, CEO               |

\* Retired

## EXECUTIVE



## COMPENSATION

| Rank | Executive/age             | 1990<br>cash<br>compensa-<br>tion | %<br>change<br>from<br>1989 | Company                | Position                             |
|------|---------------------------|-----------------------------------|-----------------------------|------------------------|--------------------------------------|
| 51   | John V. Roach/51          | 873,749                           | -10.0                       | Tandy                  | Chairman, President, CEO             |
| 52   | Jim P. Manzi/39           | 867,545                           | -12.5                       | Lotus                  | Chairman, President                  |
| 53   | Jerome Swartz/50          | 863,150                           | .0                          | Symbol Technologies    | Chairman, CEO                        |
| 54   | William E. Johnson        | 856,257                           | -2.1                        | Scientific-Atlanta     | Vice Chairman, CEO                   |
| 55   | Joseph T. Casey/59        | 852,670                           | NA                          | Litton Industries      | CFO, Director                        |
| 56   | C. Scott Holt/49          | 828,262                           | 85.8                        | Conner Peripherals     | Executive VP Sales & Marketing       |
| 57   | James M. Harris/47        | 825,000                           | 12.6                        | Compaq Computer        | Sr. VP, Engineering                  |
| 58   | Gary Stimac/39            | 825,000                           | 12.3                        | Compaq Computer        | Sr. VP, Systems Engineering          |
| 59   | Christopher J. Steffen/49 | 794,445                           | 63.2                        | Honeywell              | Executive VP, CFO                    |
| 60   | Donald L. Waite           | 792,110                           | 66.6                        | Seagate Technology     | Sr. VP, CFO                          |
| 61   | Winston R. Wallin/64      | 791,423                           | 18.0                        | Medtronic              | Chairman, President, CEO             |
| 62   | Bruce O. Beebe/54         | 782,878                           | NA                          | Amdahl                 | Sr. VP, Product Operations           |
| 63   | J. Tracy O'Rourke         | 782,192                           | NA                          | Varian Associates      | Chairman, CEO                        |
| 64   | George B. Harvey/59       | 774,756                           | -10.2                       | Pitney Bowes           | Chairman, President, CEO             |
| 65   | Wayland R. Hicks          | 765,952                           | 23.5                        | Xerox                  | Executive VP                         |
| 66   | John F. Mitchell/62       | 763,942                           | -9.7                        | Motorola               | Vice Chairman                        |
| 67   | Gary L. Tooker/51         | 763,224                           | 14.2                        | Motorola               | President, COO                       |
| 68   | Carl Neun/47              | 756,761                           | NA                          | Conner Peripherals     | Sr. VP                               |
| 69   | Roland D. Peterson        | 737,678                           | NA                          | Litton Industries      | President, COO                       |
| 70   | William C. Lowe           | 735,236                           | 38.4                        | Xerox                  | Executive VP                         |
| 71   | Charles M. Clough/62      | 730,000                           | NA                          | Wyle Laboratories      | President, CEO                       |
| 72   | Stuart B. Ross            | 726,719                           | NA                          | Xerox                  | Executive VP                         |
| 73   | Andrew S. Grove/53        | 723,003                           | 3.2                         | Intel                  | President, CEO                       |
| 74   | Sidney Topol/65           | 711,701                           | 58.9                        | Scientific-Atlanta     | Chairman                             |
| 75   | Robert Galvin/68          | 700,000                           | .0                          | Motorola               | Chairman                             |
| 76   | Horace G. McDonnell/62    | 690,611                           | NA                          | Perkin-Elmer           | Chairman, CEO                        |
| 77   | A. Lowell Lawson/53       | 680,813                           | 14.8                        | E-Systems              | President                            |
| 78   | D. Larry Moore/54         | 678,837                           | NA                          | Honeywell              | Exec. VP, CEO                        |
| 79   | Gilbert P. Williamson/53  | 672,667                           | 17.7                        | NCR                    | President                            |
| 80   | Arnold Mazur/47           | 667,961                           | NA                          | Computer Associates    | Exec. VP                             |
| 81   | Gordon E. Moore/61        | 665,533                           | 3.5                         | Intel                  | Chairman                             |
| 82   | Philippe Kahn/38          | 664,648                           | NA                          | Borland International  | President, CEO                       |
| 83   | Joe E. Chenoweth          | 658,511                           | 16.5                        | Honeywell              | Sr. Corp. VP, International          |
| 84   | Thomas A. Vanderslice/59  | 652,324                           | NA                          | M/A-Com                | Chairman, CEO                        |
| 85   | W. J. Sanders III/54      | 651,167                           | -25.9                       | Advanced Micro Devices | Chairman, CEO                        |
| 86   | Jeffrey L. Walker         | 644,882                           | NA                          | Oracle                 | Exec. VP, CFO                        |
| 87   | M. Howard Dingman Jr.     | 643,947                           | NA                          | Litton Industries      | Senior VP, Pres. Western Atlas Int'l |
| 88   | Dennis M. Ohryn           | 640,250                           | 81.6                        | Sun Microsystems       | VP Worldwide Field Operations        |
| 89   | Phillip W. Colburn/62     | 637,500                           | NA                          | Allen Group            | Chairman, CEO                        |
| 90   | Winston H. Chen/49        | 634,696                           | NA                          | Solelectron            | Pres., CEO                           |
| 91   | Michael R. Bonsignore/49  | 631,521                           | 2.1                         | Honeywell              | President, International             |
| 92   | Stewart Carrell/57        | 625,262                           | -37.4                       | Diasonics              | Chairman, CEO                        |
| 93   | Michael P. DeBlasio/52    | 623,041                           | 17.0                        | Loral                  | Sr. VP Finance                       |
| 94   | Jerome Swartz/50          | 622,070                           | -27.9                       | Symbol Technologies    | Chairman, CEO                        |
| 95   | James C. Morgan/52        | 613,346                           | -13.8                       | Applied Materials      | Chairman, CEO                        |
| 96   | Joseph B. Costello/37     | 606,597                           | NA                          | Cadence Design Systems | President, CEO                       |
| 97   | Joseph F. Caligiuri       | 606,125                           | NA                          | Litton Industries      | Executive VP                         |
| 98   | Max E. Bleck/63           | 605,004                           | NA                          | Raytheon               | Pres. Beech Aircraft                 |
| 99   | Richard C. Alberding      | 604,959                           | -2.7                        | Hewlett-Packard        | Executive VP                         |
| 100  | Thomas D. Sege/63         | 604,221                           | 56.4                        | Varian Associates      | Director, Chairman, CEO              |

\* Retired